

Amendments to the Claims

This listing of claims will replace all prior versions and listing of claims in this application.

Listing of claims:

1. (Currently Amended) An olefin polymerization catalyst characterized by the formula



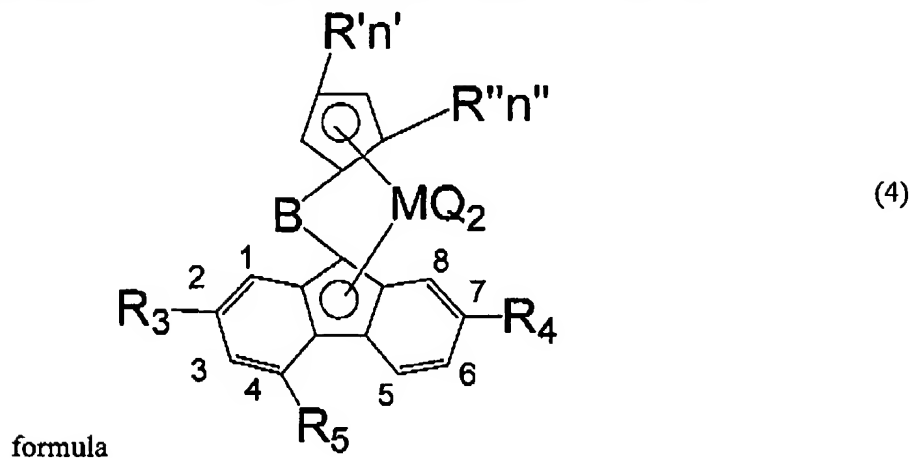
wherein:

- a. Flu is a fluorenyl group substituted at at least one of the 4,5 positions by a bulky hydrocarbyl group containing ~~at least four carbon atoms~~ a cyclic compound having from 3 to 30 carbon atoms;
 - b. A is a substituted or an unsubstituted cyclopentadienyl group, a substituted or unsubstituted indenyl group, or a heteroorgano group XR in which X is a heteroatom from Group 15 or 16 of the Periodic Table, and R is an alkyl group, a cycloalkyl group or an aryl group containing from 1 to 20 carbon atoms;
 - c. B is a structural bridge between A and Flu imparting stereorigidity to the ligand structure (FluA);
 - d. M is a Group 4 or Group 5 transition metal;
 - e. Q is selected from the group consisting of Cl, Br, I, an alkyl group, an amino group, an aromatic group and mixtures thereof; and
 - f. n is 1 or 2.
2. (Currently Amended) The catalyst composition of claim 1 wherein Flu is substituted at both of the 4 and 5 positions with a bulky hydrocarbyl group containing ~~at least four carbon atoms~~ a cyclic compound having from 3 to 30 carbon atoms.
 3. (Currently Amended) The catalyst composition of claim 1 wherein Flu is mono-substituted at the 4(~~5~~) 4 or 5 position and is otherwise unsubstituted.
 4. (Currently Amended) The catalyst composition of claim 1 wherein Flu is mono-substituted at the 4(~~5~~) 4 or 5 position and is di-substituted at the 2,7 positions with

alkyl groups, phenyl or substituted phenyl groups, which may be the same or different.

5. (Currently Amended) The catalyst composition of claim 4 wherein the fluorenyl group Flu is di-substituted at the 2,7 positions with substituents of a lower molecular weight than the substituent at the ~~4(5)~~ 4 or 5 position.
6. (Currently Amended) The catalyst composition of claim 4 wherein the fluorenyl group Flu is di-substituted at the 3,6 position with alkyl groups of a lower molecular weight than the substituent at the ~~4(5)~~ 4 or 5 position.
7. (Original) The catalyst composition of claim 1 wherein A is a heteroorgano group XR and X is N, P, O or S.
8. (Original) The composition of claim 6 wherein 7 is N and R is a mononuclear aromatic group or an alkyl group or cycloalkyl group containing from 1 - 20 carbon atoms.
9. (Original) The composition of claim 1 wherein said structural bridge B is characterized by the formula ER'R" wherein E is C, Si or Ge and R' and R" are each independently an alky group, an aromatic group or a cycloalkyl group.
10. (Original) The composition of claim 1 wherein A is a substituted or unsubstituted cyclopentadienyl group.
11. (Original) The composition of claim 10 wherein M is titanium, zirconium or hafnium.
12. (Original) The composition of claim 11 wherein Flu is substituted at one of the 4 or 5 positions with a phenyl group which is substituted or unsubstituted.
13. (Original) The composition of claim 12 wherein A is cyclopentadienyl group substituted at the 3 position with a tertiary butyl group.
14. (Original) The composition of claim 13 wherein said cyclopentadienyl group is substituted at the 5 position with a methyl group.
15. (Original) The composition of claim 13 wherein said fluorenyl group is di-substituted at the 2,7 positions with isopropyl or tertiary butyl groups.

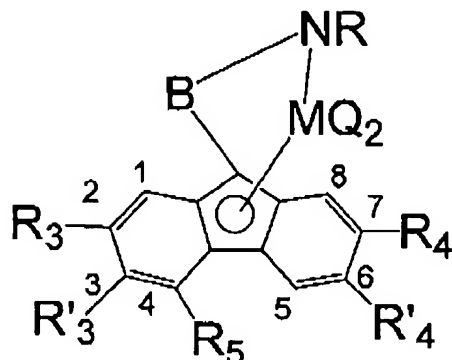
16. (Currently Amended) An olefin polymerization catalyst characterized by the



wherein:

- a. R' is a C₁ – C₄ alkyl group or an aryl group;
 - b. R'' is a methyl group or an ethyl group;
 - c. n' is 0 or 1;
 - d. n'' is 0 or 1;
 - e. B is a structural bridge between the fluorenyl and cyclopentadienyl groups;
 - f. M is titanium, zirconium or hafnium;
 - g. Q is selected from the group consisting of Cl, Br, I, an alkyl group, an amino group, an aromatic group and mixtures thereof;
 - h. R₃ and R₄ are the same or different and are each a hydrogen or an isopropyl group or a tertiary butyl group, or phenyl, or substituted phenyl group; and
 - i. R₅ is an alkyl or aromatic group which has a higher molecular weight than R₃ or R₄.
17. (Original) The catalyst of claim 16 wherein R' is a tertiary butyl group and n' is 1, R₃ and R₄ are each tertiary butyl groups and R₅ is a substituted or unsubstituted phenyl group.
18. (Original) The catalyst composition of claim 17 wherein n'' is 1.
19. (Original) The catalyst of claim 18 wherein R'' is a methyl group.

20. (Original) The composition of claim 17 wherein R_5 is a 4-tertiary butyl phenyl group.
21. (Original) An olefin polymerization catalyst characterized by the formula

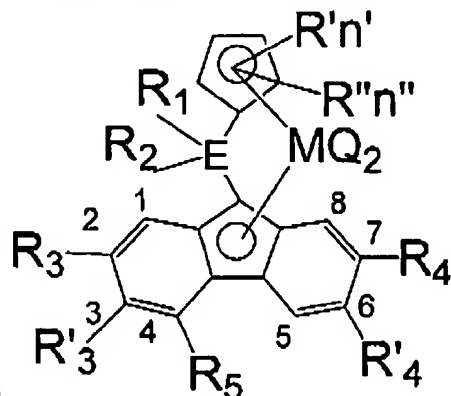


(5)

wherein:

- R is a mononuclear aromatic group, or an alkyl group or cycloalkyl group containing from 1 - 20 carbon atoms;
 - B is a structural bridge between the fluorenyl group and the heteroatom group NR ;
 - M is titanium, zirconium or hafnium;
 - Q is selected from the group consisting of Cl , Br , I , an alkyl group, an amino group, an aromatic group and mixtures thereof;
 - R_3 and R_4 are the same or different and are each a hydrogen or a $C_1 - C_4$ alkyl group, or phenyl, or substituted phenyl group;
 - R'_3 and R'_4 are each hydrogen or a $C_1 - C_4$ alkyl group providing that when R_3 and R_4 are hydrogen, R'_3 and R'_4 are hydrogen; and
 - R_5 is an alkyl or aromatic group which has a higher molecular weight than R_3 or R_4 .
22. (Original) The catalyst of claim 21 wherein R_3 and R_4 are each a tertiary butyl group, R'_3 and R'_4 are each a $C_1 - C_4$ alkyl group and R_5 is a substituted or unsubstituted phenyl group.
23. (Original) The composition of claim 22 wherein R is tertiary butyl group.
24. (Original) The catalyst of claim 21 wherein R_3 and R_4 are each hydrogen and R_5 is a tertiary butyl group, a phenyl group, or a substituted phenyl group.

25. (Currently Amended) An olefin polymerization catalyst characterized by the



formula

wherein:

- R' is a C₁ – C₄ alkyl group or an aryl group;
 - n' is from 0 to 3;
 - R'' is an alkyl group of a lower molecular weight than R';
 - n'' is 0 or 1;
 - E is –C– or –Si–;
 - R₁ and R₂ are the same or different and are each a methyl group, a phenyl group or a substituted phenyl group;
 - M is titanium, zirconium or hafnium;
 - Q is a chlorine, a methyl group or a phenyl group;
 - R₃ and R₄ are the same or different and are each a hydrogen or a C₁ – C₄ alkyl group, or phenyl, or substituted phenyl group;
 - R'₃ and R'₄ are each hydrogen or a C₁ – C₄ alkyl group provided that when R₃ and R₄ are hydrogen, R'₃ and R'₄ are hydrogen; and
 - R₅ is an ~~alkyl group~~ or aromatic group which has a higher molecular weight than R₃ or R₄.
26. (Currently Amended) The catalyst of claim 25 wherein n' and n'' are 0, R₃ and R₄ are each hydrogen, and R₅ is a ~~tertiary butyl group~~ or a substituted or unsubstituted phenyl group.
27. (Original) The catalyst of claim 25 wherein R₃ and R₄ are each independently a C₁ – C₄ alkyl group and R₅ is a substituted or unsubstituted phenyl group.

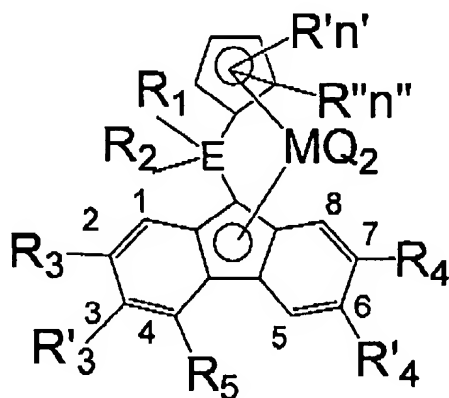
28. (Original) The catalyst composition of claim 25 wherein R_3 and R_4 are tertiary butyl groups, R_5 is a substituted or unsubstituted phenyl group and n' and n'' are each 0.
29. (Original) The catalyst composition of claim 25 wherein n' is 1 and R' is a tertiary butyl group substituted on said cyclopentadienyl group at the 3 position.
30. (Original) The catalyst composition of claim 29 wherein R_3 and R_4 are tertiary butyl groups and R_5 is a phenyl group or a 4-tertiary butyl phenyl group.
31. (Original) The catalyst composition of claim 29 wherein n'' is 1 and R'' is a methyl group substituted on said cyclopentadienyl group at the 5 position.
32. (Withdrawn) A process for the polymerization of an ethylenically unsaturated monomer comprising:
- a. providing a transition metal catalyst characterized by the formula



wherein:

- i. Flu is a fluorenyl group substituted at at least one of the 4,5 positions by a bulky hydrocarbyl group containing at least four carbon atoms;
- ii. A is a substituted or an unsubstituted cyclopentadienyl group, a substituted or unsubstituted indenyl group, or a heteroorgano group XR in which X is a heteroatom from Group 15 or 16 of the Periodic Table, and R is an alkyl group, a cycloalkyl group or an aryl group containing from 1 to 20 carbon atoms;
- iii. B is a structural bridge between A and Flu, imparting stereorigidity to the ligand structure (FLA);
- iv. M is a Group 4 or Group 5 transition metal;
- v. Q is selected from the group consisting of Cl, Br, I, an alkyl group, an aromatic group and mixtures thereof; and
- vi. n is 1 or 2;

- b. providing an activating cocatalyst component;
 - c. contacting said catalyst component and said cocatalyst component in a polymerization reaction zone with an ethylenically unsaturated monomer under polymerization conditions to produce a polymer product by polymerization of said monomer; and
 - d. recovering said polymer product from said reaction zone.
33. (Withdrawn) The process of claim 32 wherein said monomer comprises propylene and said polymer product is a polypropylene homopolymer or copolymer.
34. (Withdrawn) The process of claim 33 wherein said transition metal catalyst is characterized by the formula



(6)

wherein:

- a. R' is a C₁ – C₄ alkyl group or an aryl group;
- b. n' is from 0 to 3;
- c. R'' is an alkyl group of a lower molecular weight than R';
- d. n'' is 0 or 1;
- e. E is –C– or –Si–;

- f. R_1 and R_2 are the same or different and are each a methyl group, a phenyl group or a substituted phenyl group;
- g. M is titanium, zirconium or hafnium;
- h. Q is a chlorine, a methyl group or a phenyl group;
- i. R_3 and R_4 are the same or different and are each a hydrogen or a $C_1 - C_4$ alkyl group or phenyl, or substituted phenyl group;
- j. R'_3 and R'_4 are each hydrogen or a $C_1 - C_4$ alkyl group provided that when R_3 and R_4 are hydrogen, R'_3 and R'_4 are hydrogen;
- k. R_5 is an alkyl group or aromatic group which has a higher molecular weight than R_3 or R_4 ;

and said polymer product is an isotactic polypropylene.

- 35. (Withdrawn) The process of claim 33 wherein n' is 1 and R' is a tertiary butyl group substituted on said cyclopentadienyl group at the 3 position.
- 36. (Withdrawn) The process of claim 34 wherein R_3 and R_4 are tertiary butyl groups and R_5 is a phenyl group or a 4-tertiary butyl phenyl group.
- 37. (Withdrawn) The process of claim 35 wherein n'' is 1 and R'' is a methyl group substituted on said cyclopentadienyl group at the 5 position.
- 38. (New) The catalyst of claim 1 wherein the bulky hydrocarbyl group is an aromatic group.
- 39. (New) The catalyst of claim 1 wherein the bulky hydrocarbyl group is a multi-ring aromatic group.
- 40. (New) The catalyst of claim 1 wherein the bulky hydrocarbyl group is a contiguous multi-ring aromatic group.